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Enclosed for filing is a patent application under 37 CFR 1.53(b) of:

Inventor: Gregory E. Borchers

For: **COMPUTER, PRINTER AND SOFTWARE FOR CHANGING  
CONTROL OF PRINTER MARKING DEVICE WHILE PRINTING  
ON A SINGLE PAGE**

Enclosures:

- ☒ [X] Specification (pages 1-9); claims (pages 10-12); abstract (page 13)
- ☒ [X] 5 sheet(s) of 7 formal drawings
- ☒ [X] Declaration or Combined Declaration and Power of Attorney
  - ☒ [X] Newly executed (original or copy)
  - ☐ [ ] Copy from a prior application (37 CFR 1.63(d))
  - ☐ [ ] Incorporation by Reference--The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.
  - ☐ [ ] Deletion of Inventors (signed statement attached deleting inventor(s) named in the prior application (37 CFR 1.63(d)(2) and 1.33(b))
- ☐ [ ] Power of Attorney
- ☒ [X] Assignment with cover sheet

- ☐ Certified copy of priority document:  
☒ Information Disclosure Statement with Form PTO 1449  
☒ Copies of references listed on attached Form PTO-1449  
☐ Preliminary Amendment

CLAIMS AS FILED				
For	Number Filed	Number Extra	Rate	Basic Fee \$690.00
Total Claims	1020		X \$18.00 =	\$0
Independent Claims	3-3		X \$78.00 =	\$0
TOTAL FILING FEE				\$690.00

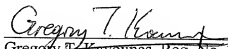
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Respectfully submitted,

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**COMPUTER, PRINTER AND SOFTWARE FOR CHANGING CONTROL  
OF PRINTER MARKING DEVICE WHILE PRINTING ON A SINGLE PAGE**

**BACKGROUND OF THE INVENTION**

1. Field of the invention

The present invention is related to the field of electronic printers, and more specifically to a computer, a printer and software for changing control settings of a printer's marking device while printing on a page.

2. Description of the related art

Electronic printers are used for printing on sheets of paper. A marking device of the printer is set once, for printing on a whole page. This can be a problem in certain situations, especially where different types of printing must be combined on the same page. The problem is exacerbated where a single sheet of paper has regions of different textures, where different settings of the marking device are optimum for printing on each texture. An example is now described.

Referring to Fig. 1, a page 10 has a first region 12 with a first type of texture, and a second region 14 with a second type of texture. The first texture of first region 12 is suited for printing text thereon, while the second texture of second region 14 is suited for printing a photograph thereon. The page 10 can be a special sheet for printing an individual's identification card.

Printers in the prior art define raster scan lines 22, 24 on the entire page 10. Only six such scan lines 22, 24, are shown, but that is only so as not to confuse the drawing. In fact many more are typically defined in a single page. It should be noted that scan lines 24 span only the first region 12, while scan lines 22 span both the first region 12 and the second region 14.

The problem is that the portions of scan lines 22 in the second region 14 appear not sharp, or smudged. That is because a marking device of the printer is set for marking

according to what is optimum for the first texture of the first region 12. This setting is typically not also the optimum setting for marking on the second texture of the second region 14.

The problem is simply avoided in the prior art by processing the page 10 through the printer twice. First one prints only on the first region a number of similar pages, and then they eject the page. Then they reinsert the pages in the printer, and reset the marking device for optimum printing on the second region 14. The process is cumbersome, and reinsertion is subject to alignment errors.

The prior art uses a specific data structure (also known as data format) for printer ready data. Referring to Fig. 2, the prior art data structure 200 is described. This is data works with Printer Control Languages (PCLs) and Page Description Languages (PDLs) for printers such as raster printers and other types of printers.

Data structure 200 includes a data group 210 with job settings for marking device initialization. It also includes a data group 210 with job settings for marking device control codes. These are followed by data groups 230, 240, ..., 250 each of which has raster data for corresponding scan lines. Then follows a data group 260 with job settings for page eject and device reset.

According to data structure 200, the entire page is processed. The marking device moves according to all the raster scan line data, and then the page is ejected. A single setting of the marking device will have to suffice for the entire page.

## BRIEF SUMMARY OF THE INVENTION

The present invention overcomes these problems and limitations of the prior art.

Generally, the present invention provides a computer, a printer and software for changing control settings of a printer's marking device while printing on a single page. The computer prepares raster data blocks (RDB) of data for printing a single page. In addition, there are included interspersed raster control block (RCB) data for adjusting the settings of the marking device while printing on the page. While the RCB data is preferably presented between RDB data of different scan lines, the RCB data blocks can change the settings even when printing along a single scan line.

The invention will become more readily apparent from the following Detailed Description, which proceeds with reference to the drawings, in which:

### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a depiction of a sheet of paper having two regions of different surface textures, that has been printed on according to methods in the prior art.

Fig. 2 is a chart for depicting a data format in the prior art, which produces the printing result of the sheet of Fig. 1.

Fig. 3 is a block diagram of a system made according to the present invention and operating according to a method of the invention.

Fig. 4 is a chart for depicting a data format for the system of Fig. 3 according to the invention.

Fig. 5 is a table showing a detail of a first embodiment of the data format of Fig. 4 for three sample scan lines.

Fig. 6 is a table showing a detail of a second embodiment of the data format of Fig. 4 for three sample scan lines.

Fig. 7 is a flowchart illustrating a method according to the invention.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

As has been mentioned, the present invention provides a computer, a printer and software for changing control settings of a printer's marking device while printing on a page. The invention is now described in more detail.

Referring to Fig. 3, a block diagram 300 shows a system made according to the present invention, and operating according to a method of the present invention. A computer 310, such as a personal computer 310, is operated by user (not shown) from a user interface 320. The computer 310 is connected to a printer 330 made according to the present invention. The printer 330 has a marking device 332, with which it can print on pages 340.

A page 340 according to the invention can be a sheet of paper, or other surface suitable for printing text, drawings, photographs, etc. The printing surface need not be made from paper, but can be made from plastic or other equivalent material.

Page 340 is shown as having a first region 342 of a first texture, and a second region 344, of a second texture. That is not necessary, however, and page 340 can be of a homogeneous texture.

The computer 310 has a printer driver 362, and a memory 364. The printer 370 has a firmware 372. Printer driver 362 operates a program stored in memory 364 to operate firmware 372.

The printer driver 362, in combination with the firmware 372, subdivides page 340 into raster scan lines 382, 384. It will be observed that the second raster scan lines 384 span only the first region 342 of the page 340, while the first raster scan lines 382 span both the first region 342 and the second region 344 of the page 340.

The printer driver 362 additionally generates data in a special format according to the invention. The data is sent to the printer 330, for setting the marking device 332 accordingly, and also for printing according to how the marking device 313 has been set.

Referring now to Fig. 4, a data format 400 of the invention is described. Data format 400 is for printing on a single page 340, as has been prepared by the printer driver 362 and/or the firmware 372.

A box 410 in the beginning of the data string represents printer control data for initialization of the printer 330 and the marking device 332.

In addition, for each raster scan line there is a corresponding raster scan line data block (RDB). According to the present invention, individual raster scan line data blocks are preceded by corresponding raster control block (RCB) data. One or more of the individual raster scan line data blocks can have its own RCB data.

More particularly, for a first raster scan line (1), a subsequent box 430 represents a raster control block (RCB) of data for raster scan line (1). A following box 435 represents the actual raster scan line data block (RDB) for raster scan line (1).

Similarly, a following box 440 represents the RCB data for a following raster scan line (2), and immediately following box 445 represents the actual RDB data for printing along the raster scan line (2). This data format continues for the raster scan lines that the page 340 has been subdivided into.

For the last raster scan line (N), a box 450 represents the RCB data, and an immediately following box 455 represents the actual RDB data for printing along the last

raster scan line (N). After that, a box 460 represents optional data for printer control for ejecting the page 340, and for resetting the printer 330.

In each case, the RDB data is what the printer actually prints out. The RCB data is what sets the marking device of the printer, for printing the corresponding RDB data.

Details are now described of the raster control block data (RCB) and the raster scan line data blocks (RDB). Two embodiments are now described with reference to Fig. 5 and Fig. 6, for the order of printer ready data according to the invention for three scan lines X, Y, Z.

In both cases, scanline X is for employing three different settings of the marking device 332, as may be the case when the scanline X spans three different regions of the page. Similarly, scanline Y is for employing a single setting. Additionally, scanline Z is for employing two different settings of the marking device 332, for different types of printing along the scanline Z.

Referring now particularly to Fig. 5, the first embodiment is described, where the RCB blocks are given first, and the data blocks RDB follow. Specifically, for scanline X, the blocks come in the order RCB-XA, RCB-XB, RCB-XC, RDB-XA, RDB-XB, RDB-XC. For scanline Y, the blocks come in the order RCB-YA, RDB-YA. For scanline Z, the blocks come in the order RCB-ZA, RCB-ZB, RDB-ZA, RDB-ZB. In this case, the raster control block data RCB is largely in the boundaries of the raster scanline data RDB.

Referring now particularly to Fig. 6, the second embodiment is described, where each RDB block follows its corresponding RCB block. Specifically, for scanline X, the blocks come in the order RCB-XA, RDB-XA, RCB-XB, RDB-XB, RCB-XC, RDB-XC. For scanline Y, the blocks come in the order RCB-YA, RDB-YA. For scanline Z, the blocks come in the order RCB-ZA, RDB-ZA, RCB-ZB, RDB-ZB. In this case, the raster control block data RCB is intermingled with the raster scanline data RDB.

The data formats of Fig. 5 and Fig. 6 are the two simplest embodiments for presenting the data according to the invention. Other embodiments can equivalently be employed.

In both cases the RDB data is advantageously compressible. In fact, the first embodiment of Fig. 5 is preferable to the second embodiment of Fig. 6, because it permits even greater compressibility of the RDB data.

A characteristic of the invention is that the marking device 332 of the printer 330 can be reset by raster control block data between printing successive raster scan lines, or even while printing a single raster scan line. This permits fully printing on page 340 with a single pass, even while adapting the settings for different textures in different regions of page 340.

It is readily apparent that, in addition to a computer 310, the present invention can be implemented in logic circuitry, or in a dedicated microcontroller circuit.

The invention additionally provides a method. Preferably the method is implemented by software, in which case the method is implemented either by the printer driver 362, or by the firmware 372, or both.

This detailed description is presented largely in terms of display images, algorithms, and symbolic representations of operations of data bits within a computer readable medium, such as a memory. These algorithmic descriptions and representations are the means used by those skilled in the data processing arts to most effectively convey the substance of their work to others skilled in the art. A person skilled in the art of programming can use this description to readily generate specific instructions for implementing a program according to the present invention.

Often, for the sake of convenience only, it is preferred to implement and describe a program as various interconnected distinct software modules or features, also known as software. This is not necessary, however, and there may be cases where modules are equivalently aggregated into a single program with unclear boundaries.

In any event, the software modules or features of the present invention can be implemented by themselves, or in combination with others. Again, the combination can result in distinct software modules, or ones with blurred boundaries.

An algorithm is here, and generally, a self-consistent sequence of steps leading to a desired result. These steps, also known as instructions, are those requiring physical manipulations of physical quantities. Usually, though not necessarily, these quantities take the form of electrical or magnetic signals capable of being stored, transferred,







inventor regards the subject matter of the invention to include all combinations and subcombinations of the various elements, features, functions and/or properties disclosed herein.

- 5 The following claims define certain combinations and subcombinations, which are regarded as novel and non-obvious. Additional claims for other combinations and subcombinations of features, functions, elements and/or properties may be presented in this or a related document.

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1 CLAIMS

2 The invention claimed is:

3  
4 1. A method for a printer to print on a page comprising:  
5 defining a plurality of raster scan lines on the page;  
6 then setting a marking device of the printer according to a first raster control  
7 block of data;  
8 then the marking device marking on the page according to a first one of the raster  
9 scan lines;  
10 then, before reaching a second one of the raster scan lines, resetting the marking  
11 device according to a second raster control block of data; and  
12 then the marking device marking on the page according to the second raster scan  
13 line.

1 2. The method of claim 1, further comprising:  
2 receiving a first block of dot marking data for marking while the marking device  
3 is set according to the first raster control block of data; and  
4 receiving a second block of dot marking data for marking after resetting.

1 3. The method of claim 1, further comprising:  
2 starting to mark on the page according to a third one of the raster scan lines;  
3 then, before reaching a remainder of the third scan line, resetting the marking  
4 device according to a third raster control block of data; and  
5 then the marking device marking on the page according to the remainder of the  
6 third raster scan line.

1 4. The method of claim 3, further comprising:  
2 receiving a first block of dot marking data for marking while set according to the  
3 first raster control block of data; and  
4 receiving a second block of dot marking data for marking after resetting.

- 1 5. A method for a printer to print on a page having at least a first region of a first  
2 texture and a second region of a second texture, the method comprising:  
3 defining a raster scan line on the page that spans both the first and the second  
4 regions;  
5 setting a marking device of the printer according to the first texture;  
6 then the marking device marking along the raster scan line on the first region  
7 without reaching the second region;  
8 then resetting the marking device according to the first texture;  
9 then the marking device marking along the raster scan line on the second region.
- 1 6. The method of claim 5, further comprising:  
2 receiving a first block of dot marking data for marking on the first region; and  
3 receiving a second block of dot marking data for marking after resetting.
- 1 7. A computer for causing a printer to print on a page inserted in the printer, the  
2 computer system comprising a printer driver and a storage medium, wherein the storage  
3 medium has stored thereon instructions, that, when executed by the printer driver, result  
4 in:  
5 defining a plurality of raster scan lines on the page;  
6 then setting a marking device of the printer according to a first raster control  
7 block of data;  
8 then the marking device marking on the page according to a first one of the raster  
9 scan lines;  
10 then, before reaching a second one of the raster scan lines, resetting the marking  
11 device according to a second raster control block of data; and  
12 then the marking device marking on the page according to the second raster scan  
13 line.
- 1 8. The computer of claim 7, wherein the instructions, when executed by the printer  
2 driver, further result in:

3 receiving a first block of dot marking data for marking while the marking device  
4 is set according to the first raster control block of data; and  
5 receiving a second block of dot marking data for marking after resetting.

1 9. The computer of claim 7, wherein the instructions, when executed by the printer  
2 driver, further result in:

3 starting to mark on the page according to a third one of the raster scan lines;  
4 then, before reaching a remainder of the third scan line, resetting the marking  
5 device according to a third raster control block of data; and  
6 then the marking device marking on the page according to the remainder of the  
7 third raster scan line.

1 10. The computer of claim 7, wherein the instructions, when executed by the printer  
2 driver, further result in:

3 receiving a first block of dot marking data for marking while set according to the  
4 first raster control block of data; and  
5 receiving a second block of dot marking data for marking after resetting.

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Fig. 1  
(PRIOR ART)

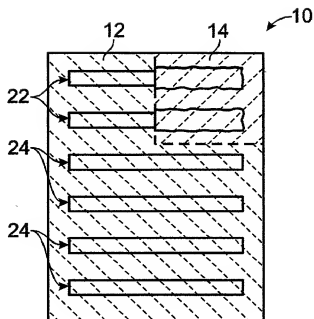


Fig. 2  
(PRIOR ART)

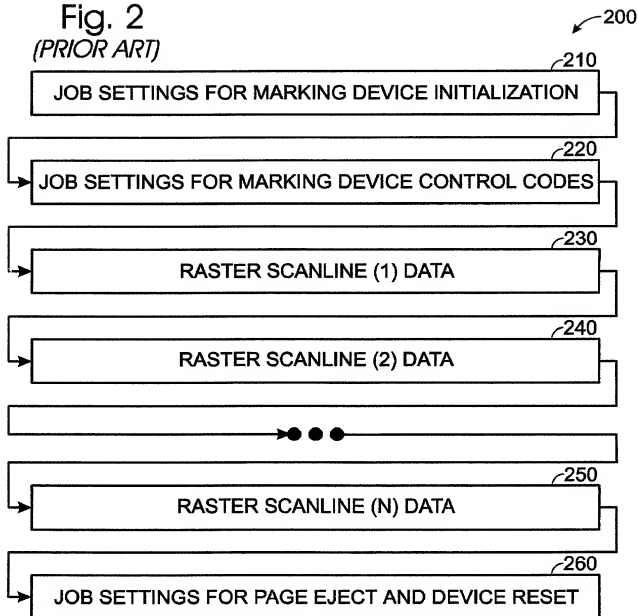




Fig. 3  
300

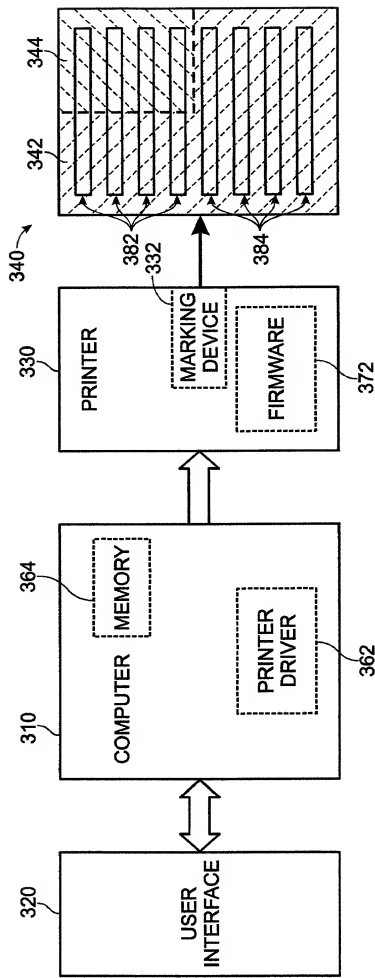


Fig. 4

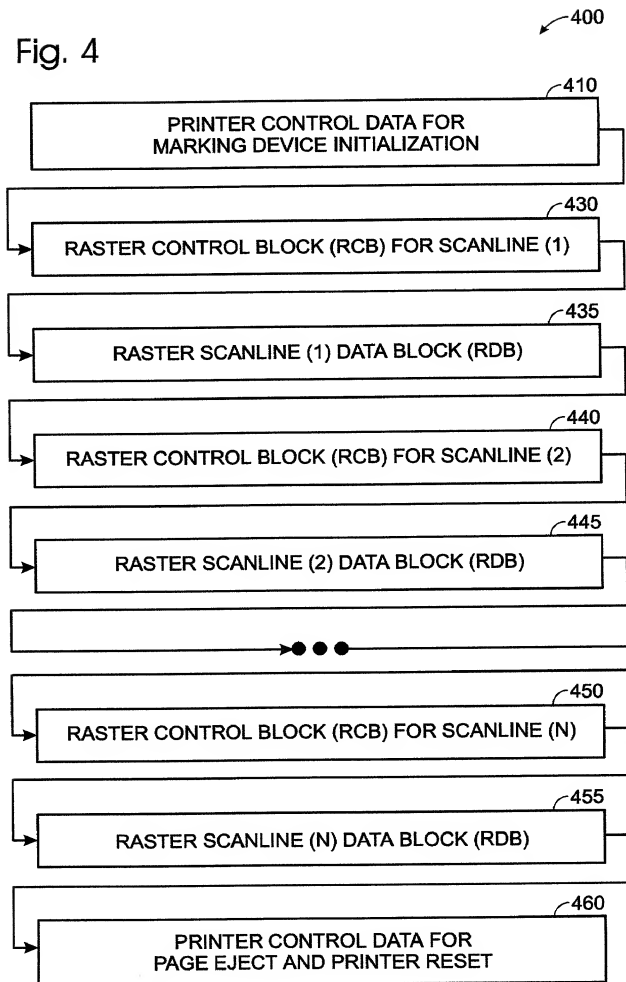


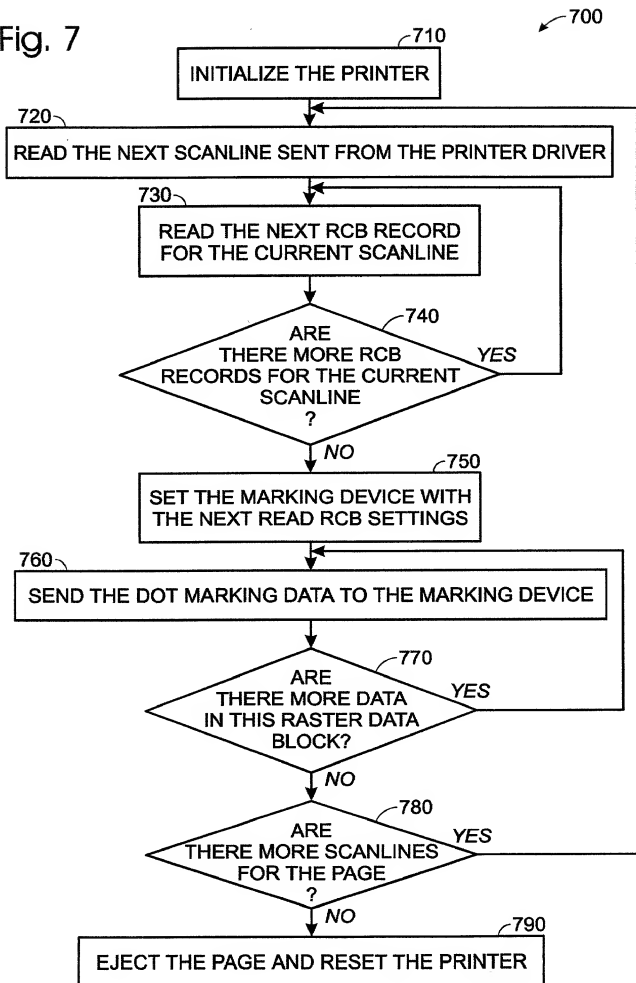
Fig. 5

SCANLINE	RCB			RDB		
X	RCB-XA	RCB-XB	RCB-XC	RDB-XA	RDB-XB	RDB-XC
Y	RCB-YA			RDB-YA		
Z	RCB-ZA			RDB-ZA	RDB-ZB	

Fig. 6

SCANLINE	RCB/RDB					
X	RCB-XA	RDB-XA	RCB-XB	RDB-XB	RCB-XC	RDB-XC
Y	RCB-YA	RDB-YA				
Z	RCB-ZA	RDB-ZA	RCB-ZB	RDB-ZB		

Fig. 7



COMBINED DECLARATION AND POWER OF ATTORNEY  
FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled, "**COMPUTER, PRINTER AND SOFTWARE FOR CHANGING CONTROL OF PRINTER MARKING DEVICE WHILE PRINTING ON A SINGLE PAGE**," the specification of which:

☒ is attached hereto.  
☐ was filed on \_\_\_\_\_ as Application No. \_\_\_\_\_  
☐ and was amended on \_\_\_\_\_ (if applicable)  
☐ with amendments through \_\_\_\_\_ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, Sec. 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Sec. 119 (a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)

Claiming  
Priority?

\_\_\_\_\_  
(Number)

\_\_\_\_\_  
(Country)

\_\_\_\_\_  
(Day/Month/Year Filed)

☐ ☐  
Yes No

I hereby claim the benefit under Title 35, United States Code, Sec. 119(e) of any United States provisional application listed below:

Provisional Application No.

Filing Date

\_\_\_\_\_

\_\_\_\_\_

I hereby claim the benefit under Title 35, United States Code, Sec. 120 or §365(c) of any PCT international application designating the United States of America listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Sec. 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Sec. 1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application No.)

(Filing Date)

(Status) (patented, pending, abandoned)

I hereby appoint the following attorneys to prosecute the application, to file a corresponding international application, to prosecute and transact all business in the Patent and Trademark Office connected therewith:

Customer No. 20575


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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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